RAPID BIOASSESSMENT OF THE BLUE RIVER AND UPPER EEL RIVER WATERSHEDS USING BENTHIC MACROINVERTEBRATES

for the Soil and Water Conservation Districts of Noble & Whitley Counties

Study conducted during June and October 1994

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EXECUTIVE SUMMARY

A rapid bioassessment of the benthic communities of the Blue and upper Eel Rivers in northeastern Indiana was conducted in June and October 1994. The purpose of the assessment was to document the degree of biological impairment present in the waterbodies prior to initiation of various land treatments.

The study showed that all five sites examined were "slightly" to "moderately" impacted, compared to a nearby "reference" stream. Although lower aquatic habitat values at each study site contributed to observed biological impacts, degraded water quality appeared to be a problem as well. The most likely cause of lower water quality at these sites was nutrient enrichment and/or sediment deposition.

There was a strong indication that water quality improved at several sites between the June and October sampling periods. For example, the two Eel River sites had biological index scores indicating "moderate" impairment in June but only "slight" impairment in October. The reason for this improvement is not clear, but the numbers of sediment-intolerant animals did not increase between sampling periods. Therefore, decreased rates of sediment deposition are probably not responsible for the improvement.

The most biologically depressed site occurred in the Eel River downstream from Blue River. Previous studies have shown that this site also had the lowest biotic index value for fish communities in the Eel River system. Water quality problems other than sedimentation may contribute to the depressed conditions at this site.

INTRODUCTION

This study was conducted to measure the "biological integrity" of the Blue and upper Eel Rivers in northeastern Indiana. Both streams have been identified by the Soil and Water Conservation Districts of Whitley and Noble Counties and by the Indiana Department of Environmental Management (IDEM) as having seriously degraded water quality due to nonpoint sources of pollution [1]. By conducting studies of the biological community of the Blue and Eel Rivers before and after application of land treatments in the watershed, the study can help determine whether treatments resulted in improved water quality as reflected by an improved aquatic biological community.

Land treatments in the watershed were initiated in October 1993 and continued through the summer of 1994. The first study of the biological communities of these streams was conducted in June 1994. The second study was conducted in October 1994, shortly after completion of all land treatments planned for the watershed.

Local Setting

Blue River and the upper Eel River lie in the "Eastern Corn Belt Plain" ecoregion of the Central U.S. This area is composed of a glacial till plain broken by various glacial features, including glacial lakes. The natural vegetation consists of a diverse beech/maple and oak/hickory forest. Soils are composed of loamy glacial till. About 75% of the ecoregion is in cropland, primarily for corn and soybeans [2].

Blue River is a "fourth order" stream with a total watershed area of about 180 square kilometers. The upper watershed includes several glacial lakes having a total surface area of about 260 hectares. The watershed is extensively farmed and the Blue River is highly channelized to enhance drainage in most areas.

Eel River upstream from Blue River is also a "fourth order" stream. Total watershed area is about 265 square kilometers, but only one small natural lake is present. Like Blue River, the upper Eel River is also extensively channelized for drainage.

Five sites were chosen for study in these watersheds (Fig. 1). The selection of each site was dependent primarily on where land treatments were to be applied. A summary of each site and its watershed area is shown below:

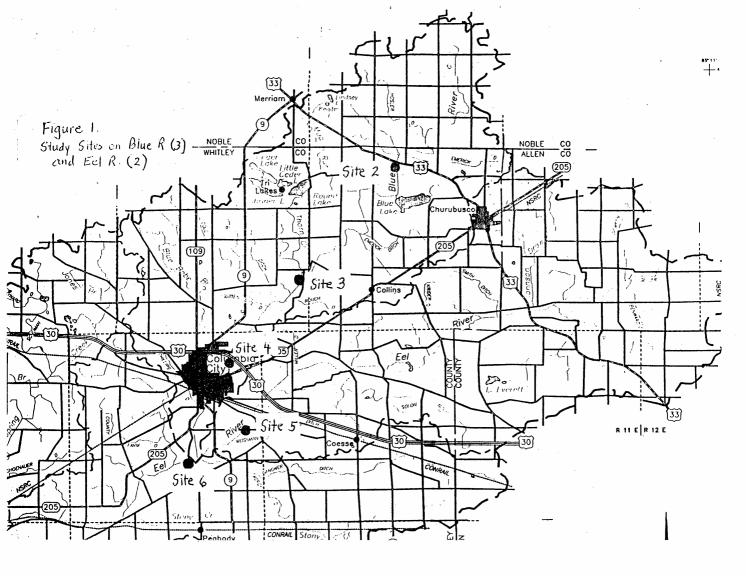
Site 2	Blue River @ Hwy 33	55 square kilometers
Site 3	Blue River near Riley Rd.	125 square kilometers
Site 4	Blue River @ Hwy 30	200 square kilometers
Site 5	Eel River @ CR 200 S	200 square kilometers
Site 6	Eel River @ Washington Rd.	475 square kilometers

METHODS

Because they are considered to be more sensitive to local conditions and respond relatively rapidly to change [3], benthic (bottom-dwelling) organisms were used to document the biological condition of both Blue River and Eel River. The U.S. Environmental Protection Agency (EPA) has recently developed a "rapid bioassessment" protocol [4] which has been shown to produce highly reproducible results that accurately reflect changes in water quality. We used EPA's Protocol III to conduct this study. Protocol III requires a standardized collection technique, a standardized subsampling technique, and identification of at least 100 animals from each site to the genus or species level from both "study sites" and a "reference site."

Reference Site

The upper Tippecanoe River was chosen as the "reference site" for this study. This stream, which like Blue River and Eel River is a tributary of the Wabash River, has been identified by numerous aquatic biologists as having an extremely diverse aquatic community with many "pollution intolerant" organisms present [e.g. 5]. The site chosen for study lies downstream from Baugher Lake near the small town of Wilmot in Noble County. At this location, the Tippecanoe River drains an area of about 85 square kilometers. This watershed also includes several glacial lakes having a total surface area of about 380 hectares. Agriculture is also an important land use in this watershed, but the stream is less extensively channelized than either Blue River or the upper Eel River.



Sample Collection

Samples in this study were collected by kicknet from "snag" habitat where current speed was 20-30 cm/sec. Snags were used because they were the most important benthic habitat present at all of the six study sites. At least three snags (submerged, immovable wood from tree limbs fallen into the river) were identified at each site. The kicknet was placed immediately downstream from the snag habitat while the sampler used a hand to dislodge all attached benthic organisms. The organisms were swept by the current into the kicknet and subsequently transferred to a white pan. Each sample was examined in the field to assure that at least 100 organisms were collected at each site. In addition, each site was sampled for organisms in CPOM (coarse particulate organic matter, usually consisting of leaf packs from fast-current areas). All samples were preserved in the field with 70% isopropanol.

Laboratory Analysis

In the laboratory, a 100 organism subsample was prepared from each site by evenly distributing the whole sample in a white, gridded pan. Grids were randomly selected and all organisms within grids were removed until 100 organisms had been selected from the entire sample.

Each animal was identified to the lowest practical taxon (usually genus or species). As each new taxon was identified, a representative specimen was preserved as a "voucher." All voucher specimens will ultimately be deposited in the Purdue University Department of Entomology collection.

Data Analysis

Following identification of the animals in the sample, eight "metrics" are calculated for each site. These metrics are based on knowledge about the sensitivity of each species to changes in environmental conditions and how the benthic communities of unimpacted streams are usually organized. For example, EPT animals consist of those in the insect orders Ephemeroptera, Plecoptera, and Trichoptera, which are known to be more sensitive than most other benthic animals to degradation of environmental conditions. Feeding behaviors such as "scrapers," "filterers," and "shredders" change predictably under different conditions. The sum of all eight metrics provides an individual "biotic score" for each site.

Quality Assurance

To help assure the quality of the results, a duplicate sample was collected at Site 4 during October. The biological scores of each sample were measured to determine the amount of variability associated with the technique. Ideally, the individual scores of duplicate samples should be within about 10% of the mean score to assure that reproducible results are obtained.

RESULTS

Quality Assurance

The biotic index scores of site 4, as determined by duplicate samples, were 22 and 26, respectively, during the October sampling period (see Appendix). These values were within 10% of the mean and the use impairment categories obtained by both samples were identical. This indicates that the bioassessment technique produced reliable results during this study period.

Aquatic Habitat Analysis

When the EPA habitat scoring technique was used, the following aquatic habitat values were obtained for each site in the study:

	Score	% of Reference
Tippecanoe River (reference, Site 1)	98	100
Upper Blue River (Site 2)	91	93
Middle Blue River (Site 3)	62	63
Lower Blue River (Site 4)	73	75
Upstream Eel River (Site 5)	69	70
Downstream Eel River (Site 6)	80	82

The maximum value obtainable by this scoring technique is 135, with higher values indicating better habitat. Sites with lower habitat values normally have lower biotic index values as well.

The scores indicate that the lowest habitat value in this study was at Site 2 (Blue River near Riley Road). This site was characterized by extremely steep, unvegetated bank slopes with no riparian vegetation. All study sites also suffered from various degrees of channel alteration, lack of shading, and sediment deposition.

Water Quality Measurements

	June	1994		
	D.O. mg/l	pH SU	Cond. uS	Temp. (F)
Reference Site 1 Time-5:30 pm (6/1/94)	9.7	8.3	330	73
Site 2 Time-8:00 pm (6/1/94)	8.8	7.6	500	68
Site 3 Time-6:50 pm (6/1/94)	7.7	7.4	530	68
Site 4 Time-9:15 am (6/2/94)	9.5	7.6	560	60
Site 5	9.6	7.5	570	60
Time-10:30 am (6/2/94) Site 6 Time-11:30 am (6/2/94)	10.0	7.6	600	62

Water Quality Measurements October 1994

	D.O. mg/l	pH SU	Cond. uS	Temp. (F)
		—		
Reference Site 1	11.0	7.6	550	48
Time-4:45 pm (10/11/94) Site 2	11.0	7.6	590	47
Time-3:45 pm (10/11/94) Site 3	11.3	7.2	610	49
Time-2:45 pm (10/11/94) Site 4	11.5	7.6	610	47
Time-1:30 pm (10/11/94)				
Site 5 Time-10:30 am (10/11/94	11.1	7.8	640	50
Site 6	11.0	7.8	620	51
Time-12:15 pm $(10/11/94)$)			

D.O. = Dissolved Oxygen Cond. = Conductivity Temp. = Temperature in Degrees Fahrenheit

Table 1.
Rapid Bioassessment Results - Blue and Eel Rivers - June 1994

	1	2	Si 3	te #	-	_
	1	2	3	4	5	6
Chironomidae (Midges)						
Cricotopus bicinctus		14	21	13	48	18
C. trifascia		1	19	18	2	35
C. intersectus			1			
C. sylvestris		1				9
Eukiefferiella bavarica		_	_	1		_
E. potthasti		2	5			6
Brillia flavifrons		2	5	_	_	_
Orthocladius obumbratus			3	2	1	3
Glyptotendipes sp.			_		1	
Chironomus sp.			1		_	
Endochironomus nigricans		-		_	1 3	
Stenochironomus sp.		1 3		1	3	
Polypedilum convictum P. illinoense	1	3 1	-			_
P. fallax	1	13	1			2
Tanytarsus sp.		13			2	
Rheotanytarsus sp.		5			2	
Microtendipes caelum	4	5				
Harnischia sp.	1					
Thienemannymia gr.	10	4			3	2
Simuliidae (Blackflies)	10	2		5	3	2 12
← Ephemeroptera (Mayflies)		۷		J	3	12
Stenacron interpunctatum		1		1	1	
Stenonema vicarium		1				
Stenonema immatures	1	_				
Baetis flavistriga	_	16	10	13		
B. brunneicolor		10	7	11		
B. amplus		1	i			
Baetis immatures		1	12	23	2	4
Pseudocloeon	1	_			_	_
Caenis		3	2			
Trichoptera (Caddisflies)						
Ceraclea	4				1	
Cheumatopsyche			2	2	6	2
Hydropsyche betteni		1	2	2	2	2
H. dicantha			1	3		1
Ceratopsyche bifida		1	1	3	1	
Plecoptera (Stoneflies)						
Isoperla		3				
Phasganophora	32		1			

Table 1 (continued)
Rapid Bioassessment Results - Blue and Eel Rivers - June 1994

	1	2	Si 3	te # 4	5	6
Coleoptera (Beetles)						
Ancyronyx variegata Macronychus glabratus	3	3	3		2 5	
Stenelmis	1		J		_	
Dubiraphia		7	1		11	2
Odonata (Dragonflies)				1		
Aeshna Amphipoda (Scuds)				Τ.		
Hyalella azteca	8					
Isopoda (Pillbugs)						
Caecidotea	22				5	2
Gastropoda (Snails) Gyraulus deflectus	3	1				
Amnicola limosa	3 7					
other Pleuroceridae	1					
Ferrissia	1					
Pelecypoda (Clams) Pisidium			1			
Oligochaeta (Worms)			Τ.			
Tubificidae		1		1		
Total	100	100.	100	100	100	100

Table 2. Data Analysis - June 1994 METRICS

	METRICS					
	1	2	Sit 3	e #	5	6
# of Genera	15	20	15	12	18	11
Biotic Index	5.1	6.3	6.6	6.2	7.5	7.2
Scrapers/Filterers	>17	3.3	0.6	0.07	1.6	0.0
EPT/Chironomids	2.4	0.8	0.7	1.7	0.2	0.1
% Dominant Taxon	30	16	21	25	48	35
EPT Index	4	7	6	5	6	3
Community Loss Index	0.0	0.5	0.8	>1.3	0.6	1.1
% Shredders (CPOM)	53	6.1	0.0	0.0	1.3	3.0
	GGODING					
	SCORING		Sit	e #		
	1	2	3	4	5	6
# of Genera	6	6	6	4	6	4
Biotic Index	. 6	4	4	4	2	4
Scrapers/Filterers	6	2	0	0	0	0
EPT/Chironomids	6	2	2	4	0	0
% Dominant Taxon	4	6	4	4	0	2
EPT Index	6	6	6	6	6	2
Community Loss Index	6	4	4	2	4	4
% Shredders (CPOM)	6	0	0	0	0	0
TOTAL	46	30	26	24	18	16
% of Reference	100	65	56	52	39	35
Impairment Category	N	S	S	M	М	М
N = NONE	S = SLIGHT	M =	MODE	RATE		

Table 3.
Rapid Bioassessment Results - Blue and Eel Rivers - October 1994

	1	2	Sit 3	te # 4	5	6
Chironomidae (Midges) Cricotopus bicinctus		7	2	2	2	15
C. sylvestris Orthocladius obumbratus Dicrotendipes neomodestus Glyptotendipes sp. Endochironomus subtendens		16	1	5	4 12 10 1	1 2 2
Stenochironomus sp. Polypedilum convictum	1	1 1			5	2 1
Parametriocneumus lundbecki Paralauterborniella sp.		5		1	6	1
Paratanytarsus sp. Psectrocladius psilopterus		2			2	1
Microtendipes caelum Thienemannymia gr. Tipulidae	3	2	4	1	15	2
Tipula sp. Simuliidae (Blackflies)		2		5		1
Empididae Ephemeroptera (Mayflies)		1			1	
Stenacron interpunctatum Stenonema vicarium	3	2	1	2 1	5	1
Baetis flavistriga B. brunneicolor	1	4 3	1 16	10 16		2
B. intercalaris Isonychia sayi			3 1			8
Caenis sp. Tricorythodes sp. Trichoptera (Caddisflies)					1 2	7
Ceraclea Cheumatopsyche	1 6	15	15	5	14	24
Hydropsyche betteni H. dicantha		11 12	16 13	35	1	17 4
H. cuanis Ceratopsyche bifida Chimarra obscura Helicopsyche borealis	2 15	8	21	5 8	1	3
Lepidostomata sp. Lepidoptera (Moths)	1.7	2				
Parargyractis sp.	1					

Table 3 (continued)
Rapid Bioassessment Results - Blue and Eel Rivers - October 1994

				lte #		
*	1	2	3	4	5	6
Coleoptera (Beetles)			-			
Macronychus glabratus	1	4	1	2		
Stenelmis	16				1	
Dubiraphia	2		4		4	2
Odonata (Dragonflies)						
Calopteryx sp.	1	1			5	1
Aeschna sp.				1		
Amphipoda (Scuds)						
Hyalella azteca	17				4	1
Isopoda (Pillbugs)						
Caecidotea so,					1	1
Lirceus sp.	7					
Gastropoda (Snails)						
Gyraulus deflectus	4				1	
Amnicola limosa	1					
Elimia livescens	12					
Ferrissia rivularis	1			1		
Physella sp.			1			
Pelecypoda (Clams)	_					
Sphaerium sp.	1					
Turbellaria (Flatworms)	4					
Total	100	100	100	100	100	100

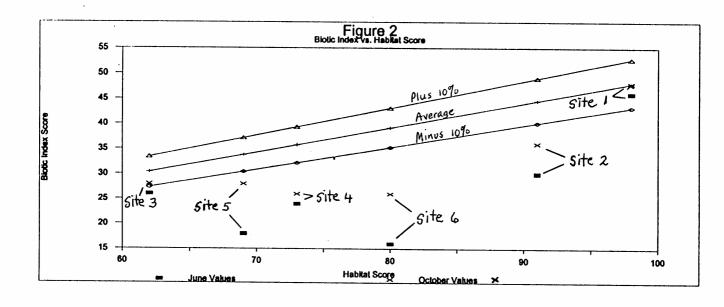
Table 4. Data Analy METR		Octol	oer 19	994		
ALIX	1	2	Site 3 ———	e # 4 	5	6
# of Genera	22	18	12	11	14	23
Biotic Index	5.2	5.8	4.7	6.1	7.3	6.7
Scrapers/Filterers	4.6	0.04	0.03	0.07	0.3	0.02
EPT/Chironomids	7.0	1.7	13	9.1	0.4	2.4
% Dominant Taxon	17	16	21	35	15	24
EPT Index	6	7	6	6	6	6
Community Loss Index	0.0	0.9	1.4	1.2	0.6	0.9
% Shredders (CPOM)	8	7	1	0	3	0
SCOR	ING 1	2	Site	e # 4	5	6
# of Genera	6	6	2	4	6	6
Biotic Index	6	6	6	4	4	4
Scrapers/Filterers	6	0	0	0	0	0
EPT/Chironomids	6	2	6	Ć	0	2
% Dominant Taxon	6	6	4	2	6	4
EPT Index	6	6	6	6	6	6
Community Loss Index	6	4	4	4	4	4
% Shredders (CPOM)	6	6	0	0	2	0
TOTAL	48	36	28	26	28	26
% of Reference	100	75	58	54	58	54
Impairment Category	N	S	S	S	s	S

DISCUSSION

A total of 38 macroinvertebrate genera were collected at the six sites during June. The most commonly collected species at most study sites during this first study period were the midges Cricotopus bicinctus and Cricotopus trifascia. Many water quality scientists regard an abundance of C. bincinctus as an indicator of toxic conditions [e.g. 6]. However, this species is also known from relatively clean-water streams. For example, both C. bincinctus and C. trifascia were among the most common benthic species observed in a headwater agricultural stream in southern Ontario [7]. Since EPT taxa, known to be sensitive to most toxicants, were also observed at each of the Blue and Eel River study sites, it is unlikely that toxicants were responsible for the water quality impairment observed at each study site.

Figure 2 shows the normal relationship of biotic index scores to habitat values (a linear relationship according to [4]). The figure also shows a range of plus or minus 10%. When biotic index values fall outside this range, the site typically has degraded water quality. Figure 2 indicates that sites 2,4,5, and 6 had biotic values considerably lower than expected from their measured habitat values during the June sampling period. Therefore, these sites were probably affected by both degraded habitat and degraded water quality. Site 6 deviated farthest from the normal relationship, indicating that its water quality may have been worse than the other sites.

By autumn, 45 genera of macroinvertebrates were present at the six sites. The predominance of <u>Cricotopus</u> midges declined sharply during the October sampling period. Instead, most samples were dominated by net-spinning caddisflies. Figure 2 shows that, during October, sites 2, 5, and 6 had improved biotic index values much closer to the values predicted by their habitat scores. In addition, Table 4 shows that Sites 5 and 6 had improved from "moderately impacted" in June to "slightly impacted" during October.



An examination of those metrics showing the greatest difference from the reference stream may provide an important clue about causes of biological impairment. During June, all study sites had few "scraper" or "shredder" organisms and a greater dominance by one or two species than the reference stream. Also most study sites had much higher numbers of chironomids than "EPT" organisms. Several of these indicators are common to many types of perturbations. However, the decline of scraper-type organisms often accompanies a decline in diatoms and a rise in filamentous algae associated with nutrient enrichment [4]. The study sites also had far more "sediment-tolerant" animals and fewer "sediment-intolerant" animals than the reference site (see Tables 5 and 6).

A similar trend in the types of metrics most affected at the study sites was apparent during the October sampling period. However, several metrics at the two Eel River sites (e.g. % dominant taxon, % shredders, EPT taxa) were much closer to the reference in October than in June, indicating a significant improvement in water quality. The percentage of sedimentintolerant organisms did not change much between sampling periods, so decreased sedimentation was probably not responsible for the observed improvements (see Table 6).

Table 5. Sediment-Tolerant Species Observed (References shown in brackets)

Cheumatopsyche sp. Hydropsyche betteni	[8] [8]	[9]
Baetis intercalaris	[8]	
(close to B. flavistriga) B. amplus Caenis sp. Tricorythodes	[8] [9] [9]	
Polypedilum convictum Rheotanytarsus sp. Chironomus sp. Thienemannymia group	[9] [9] [6] [9]	
Calopteryx spp.	[9]	
Macronychus glabratus	[9]	
Tubificidae	[11]	
SEDIMENT-TOLERANT ORG	ANISM	S
June Samples % of All Organisms at the Reference % of All Organisms at the Study Sit Site 2 34% Site 3 26% Site 4 29% Site 5 16% Site 6 6%	Site es	13%
October Samples % of All Organisms at the Reference % of All Organisms at the Study Sit Site 2 38% Site 3 40% Site 4 53% Site 5 39% Site 6 58%	: Site es	12%

Table 6. Sediment-Intolerant Species Observed (References shown in brackets)

Plecoptera	[9]
Microtendipes sp. Brillia sp.	[9] [9]
Tipula sp.	[9]
Stenonema vicarum	[9]
Parargyractis sp.	[9]
Ceraclea sp. Helicopsyche borealis	[9] [9]
Hyalella azteca	[10]
June Samples % of All Organisms	ENT-INTOLERANT ORGANISMS at the Reference Site 48% at the Study Sites
Site 2 6% Site 3 6% Site 4 0% Site 5 1% Site 6 0%	
% of All Organisms Site 2 6%	at the Reference Site 34% at the Study Sites
Site 3 1%	

Site 4

Site 5

Site 6

1%

4%

2%

Comparison to Other Studies

There are no previously published studies of the benthic macroinvertebrate communities of these streams. However, the fish communities have been studied fairly extensively. Gammon & Gammon [12] observed that in the summer of 1990 both Blue River and the upper Eel River had relatively depressed fish communities, associated with low habitat value and high turbidity and sedimentation. It is interesting to note that Gammon and Gammon's lowest biotic index score occurred on the first Eel River site downsteam from Blue River, where the lowest biotic index value was also observed in the present study.

Kittaka [13] reported even more recently that the fish community of Blue River in 1993 was dominated by "tolerant" species (those able to survive in conditions of poor water quality caused by sedimentation, toxic substances, or low dissolved oxygen, as well as in degraded habitat) and that "intolerant" fish are virtually absent from the stream. The habitat scores observed by both [12] and [13] were nearly identical to those obtained in the present study.

In contrast to these more recent studies, the fish community of the Blue River 50 years ago included several "intolerant" species which are not longer present. For example, Gerking [14] collected the rosyface shiner and the rainbow and orangethroat darters at his only collecting site on the Blue River in 1941. These species, which require good water quality and unaltered habitat, seem to have disappeared from the fauna in the last 50 years.

RECOMMENDATIONS

- 1. Continue to monitor these six sites during 1995 to determine whether a trend toward improvement in biological conditions has occurred after completion of land treatments.
- Consider concentrating additional land treatment efforts on the middle segments of Blue River and its tributaries, where water quality degradation appears to be more severe than in the upper watershed.
- 3. Encourage local entities and landowners to provide some form of bank stabilization on Blue River downstream from Riley Road, where extremely steep banks are unvegetated and frequently slumping into the stream.
- 4. Consider expanding land treatment efforts in the upper Eel River watershed, where the biotic scores are lowest.
- 5. Study the stretch of Blue River between Highway 30 and its confluence with Eel River to determine potential sources of water quality degradation at Site 6 on Eel River. Potential sources are urban runoff, the Columbia City Wastewater Treatment Plant, or abandoned waste sites. This should be done in cooperation with the Indiana Department of Environmental Management.

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MUSSELS OBSERVED DURING THE STUDY

Tippecanoe River @ Site 1

Anodonta grandis - 2 valves Villosa iris - 2 valves Villosa lienosa - 2 valves

Blue River @ Site 2

Anodonta imbecilis - live Lampsilis siliquoidea - 2 valves

Eel River @ Site 5

Anodonta grandis - live Lampsilis siliquoidea - live

FRISICAL	CHAPACTERISATION/WATER QUAL		(site1)
PRESICAL CHARACTERISATION			
BIPARIAM SOME/INSTREAM PEATURES			
Prodoninant Sucrounding Land Voo:			
Percet Field/Pasture (Agriculture) Rooid	ontiel Connercial	Industrial Other	
Local Wetershed Bresien: Bone Hederate Heavy	Some)		
Local Watershed SPS Pollution: So evidence Some	Petential Sources Obvies	s Sources	
Estimated Stream Width a Estimated Stream Dopth			
High Water Hark B Velecity Dem Press	nt: You Ho 🗸 Chan	melicod: tee 🔟 🖚	Not Recently
Canopy Covers Open Partly Open Factly She	404)&> (80404)		,
BEDIMENT/SUBSTRATE:			
sediment Odors: Bornal Sawage Fetralous	Chemical Asserbic	Bone Other	
Sediment Oile: Absent Slight Mederate P	rofue.		
Sediment Deposits: Sludge Saudust Papor Fib	or Sand Bollet She	ille Other	
hro the undersides of stomes which are not deeply unto	ddad black? Too (Ro)		
Inergenic Substrate Components Percen		Organic Substrate Componen	
Composit	len j	*	Porcont Composition
<u>Pubetrato Typo</u> <u>Diamotor</u> <u>in Samplio</u> Rodrock	Patritus	Cherestecletic	in forting Area
nearocu Boulder >256-am (10 in.) Cobbio 64-256-am (2.5-10 in.) 70	Declicat	Sticks, Wood, Coarso Plant Materials (Crom)	1010
1-44-no (0.1-2.5 in.) - 50% o ind 0.64-2.64-no (gritty) - 50% o	Nuck-Nud	Disch, Very Pine Organic (FPOM)	
111k .00406-ma (50%) - 50% (11k)	Marl	Groy, Shell Frequents	P. Crispus present
(1. (1)5/03 /10001
NATER QUALITY	a 2	220	
resperature 73 * Disselved Oxygen 9.8	a 8.3 Conductivity	330 Other	
Instrumental Pool YSI Hanna Cole	IMMER		
Streem Type: Colduster Warmunter			
fator Odoro: dormal Sovago Potroloum Ch	alcal Sone Other		- -
fator Surface Offic: Alich Shoon Globa	Plocks (1000)		
rurbidity: Cloar Slightly Turbid Turbid	Opeque Water Color		
· · · · · · · · · · · · · · · · · · ·			
SUNNY		•	
	1 1 - +	- 40.4/2.1	
PHOTOGRAPH HUMBER NUMEROUS	sphaerids present	-> samplea	
	, ,		
DESERVATIONS AND/OR SEETCH		•	

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		АТІВАН	F ASSESSMENT FIELD DATA SHE	ET TIPPECANOE	River
ab	itat Parameter	Excellent	Good	Falr	Poor
	*Bottom substrate/ available cover	Greater than 50% rubble, gravel, submerged logs, undercut banks, or other stable habitat. 16-20	30-50% rubble, gravel or other stable habitat. Adequate habitat.	10-30% rubble, gravel or other stable habitat. Habitat availability less than desirable. 6-10	Less than 10% rubble gravel or other stable habitat. Lack of habitat is obvious. 0-5
2.	Enbeddedness (b)	Gravel, cobble, and boulder particles are between 0 and 25 t surrounded by fine sediment	Gravel, cobble, and boulder perticles are between 25 and 50 t surrounded by fine sediment	Gravel, cobble, and boulder particles are between 50 and 75 t surrounded by fine sediment	Gravel, cobble, and boulder particles are over 75 % surrounded by fine sediment
		(16)20	11-15		
3.	£0.15 cms (5cfs) + *Flow(4) at rep. low flow	Cold >0.05 cms (2 cfs) Warm >0.15 cms (5 cfs) 10-20	0.03-0.05 cms (1-2 cfs) 0.05-0.15 cms (2-5 cfs) 11-15	0.01-0.03 cms (.5-1 cfs) 0.03-0.05 cms (1-2 cfs) 6-10	(0.01 cms (.5 cfs) (0.03 cms (1 cfs) 0-5
	or)0.15 cms (5cfs) + Velocity/depth	Slow ((0.3 m/s), deep ()0.5 m); slow, shallow ((0.5 m); fast ()0.3 m/s), deep; fast, shallow habitats all	Only 3 of the 4 habitat categories present (missing riffles or runs receive lower score than missing pools).	Only 2 of the 4 habitat categories present (missing tiffles/tuns receive lower score).	Dominated by one velocity/depth category (ustally pool).
		present. 16-20	(.11-)5	6-10	0 – 5
1.	• Channel alteration (a)	Little or no enlarge- ment of islands or point bars, and/or no channelization.	Some new increase in bar formation, mostly from coarse gravel; and/or some channelization present.	Moderate deposition of new gravel, coarse sand on old and new bars; pools partially filled w/silt; and/or embank- ments on both banks.	development; most pool: filled w/silt; and/or extensive channelization
		12-15	8(11)	4-7	0~3
5.	Bottom scoufing and deposition	Less then 5% of the bottom affected by scouring and deposition.	5-30% affected. Scour at constrictions and where grades steepen. Some deposition in pools.	10-50% affected. Deposits and scour at obstructions, constructions and bends. Some filling of pools.	More than 50% of the bottom changing nearly year long. Pools almost absent due to deposition. Only large rocks in riffle exposed.
		. 12-15	• 11	. 4-7	0-3

		 	
MISICAL CHARACTERISATION			
PAREAU SONE/INSTREAM PRATURES			
redeniment Surreunding Land See:			
orest field/facture Agricultural Bosidentiel	Connectal S	dustrial Other	
scal Wetershed Bresien: Hone (Hederate) Heavy			
ocal Watershed MPS Pollutioni No evidence (Some Potential	Sources Obvious	Soutces.	
stimuted Streen Width H m Setimated Streen Dopth: Biffle	0.1 . sus	_ = ++++ =	
igh Water Hark p Velecity 230 Dea Present: for	#o √ Chana	.11104: Tet V #0 _	_
emopy Cover: Open Partly Open (Partly Sheded')	15-4-4		_
EDIMENT/SUBSTRATE:			
ediment Odore: (Bornal) Sowage Potratoum Chemics	1 Annorable	Hone Other	_
edinent Oile: Absent Slight Moderate Profuse	_		
	sand Solict Shel	ia Other	
to the undersides of stemes which are not deeply embedded bloc			
		Organic Substrate Compo	anta
Inorgenic Substrate Components Forcest Composition			Percent
ubstrate Type Dismotor in Sampling Area	<u>Substrate Type</u>	Characteristic	to Scopling Area
edcock	Detritus	Sticks, Wood,	- 5%
oulder >256-on (10 in.) obbio 64-256-on (2.3-10 in.) 570		Coarso Plant Materials (CPOM)	•
ravel 2-64-mm [0.1-2.5 in.] — 4090 and 0.66-2.69-mm (gritty) — 4090 1111	f Ruck-Rud	Black, Very Fine Organic (FPOM)	
	Mark	Grey, Shell Frequents	
tay 4.004-am (etick) 10 70	•		
ATES QUALITY			
emperature C Disselved Ozygom #8	_ Conductivity	Other	
astenment(s) Used			
trees Type: Coldustor Wirmstor			
ater Odere: (Bornel) Savego Patroleum Chemical	mene Other _		
ator Surface Oils: Slick Shoon Globs Flocks	(1000)		
urbidity: (Clost) Stightly Turbid Turbid Opeque	Water Color		
TATHER COMDITIONS			
NOTOGRAPH HUMBER			

		Excellent	Good	Fall	Poor
	le, run/bend (distance iffles divided	5-7. Variety of habitat. Deep riffles and pools.	7-15. Adequate depth in pools and riffles. Bends provide habitat.	15-25. Occassional riffle or bend. Bottom contours provide some habitat.)25. Essentially a straight stream. Generally all flat water or shallow riffle. Poor
		12-15		4-7	habitat. 0-3
7. Bank stab	ility (*)	Stable. No evidence of erosion or bank failure. Side slopes generally (101. Little potential for future probles.	Moderately stable. Infrequent, small areas of erosion mostly healed over. Side slopes up to 40% on one bank. Slight potential in extreme floods.	Hoderately unstable. Hoderate frequency and size of erosional areas. Side slopes up to 60% on some banks. High erosion potential during extreme high flow.	Unstable. Hany ecoded areas. Side .slopes. 5601 common. "Raw" areas frequent along straight section and bends.
		9-10) 1-5	0-2
8. Bank vege stability	Eggra.	Over 80% of the streambank surfaces covered by vagetation or boulders and cobble:	50-79% of the streambank surfaces covered by vegetation, gravel or larger material.	25-49% of the stream- bank surfaces covered by vegetation, gravel, or larger material. 1-5	Less than 25% of the streambank surfaces covered by vegetation gravel, or larger material.
9. Streamsic	de cover ^(b)	Dominant vegetation to shrub.	Dominant vegetation is of tree form.	Dominant vegetation is grass or forbes.	Over 50% of the stream bank has no vegetation and dominant material is soil, rock, bridge materials, culverts, or mine tailings.
· ·		9 (10)	6-1	1-5	0-4
Column Total:	•	score 100		3 4 —	

	PHYSICAL CHARACTERISATION/MATER QUALITY Site 3, 6/1/94
Constitution Cons	Blue Kiver -> Riley Rd.
Constitution Cons	PRINCIPLE CHARACTERITATION (DIS THOSE Creek)
Parcent Pield/Peature Articulum Rederate Party Accal Watershed Bresion: Bone Hederate Pasay Accal Watershed Bresion: Bone Hederate Pasay Accal Watershed Bresion: Bone Hederate Pasay Accal Watershed Bresion: Bone Petitition: Bone Patential Sources Obvious Source Accal Watershed Bresion: Bone Patential Sources Sone Patential Sources Obvious Source Accal Matershed Bresion: Watership Pasay Accal Matershed Bresion: Watership Pasay Accal Matership Pasay	PIPARIAN BONE/INSTREAM PEATURES
Lacial Watershad Streets. Sone Maderate Many Lacial Watershad Streets With \$\frac{1}{4}\$ a Sectional Streets Depth Stiffet \$\frac{1}{2}\$ stum	Prodonizant Surrounding Land Voo:
Lacial Watershed BP3 Pellution: No evidence Seas Petential Sources (avious Sources) Latinated Stream Width 4 a Satinated Stream Depth: Biffle 0.2 van _ n real 0.5 a Ligh Water Mark Lanopy Cover: (new _ n valectity 30 Dam Present: Too _ No / Chamalized: Teo / No _ Lanopy Cover: (new _ n valectity Open Partity Open Partity Sheded Latinated Stream Width 4 a Satinated Stream Depth: Biffle 0.2 van _ n real 0.5 a Ligh Water Mark Lanopy Cover: (new _ n valectity Open Partity Open Partity Sheded Lanopy Cover: (new _ n valectity Open Partity Sheded Latinated Oders: (Nerset) Source Partity Sheded blacky Too No Latinated Oders: (Nerset) Source Partity Sheded blacky Too No Latinated Oders: (Nerset) Source Partity Sheded blacky Too No Latinated Oders: (Nerset) Sheded Latinated Oders: (Nerset) Source Partity Sheded blacky Too No Latinated Oders: (Nerset) Source (Nerset) Sheded Latinated Combittions	Porast Piold/Pasturo Agricultural Boaldontial Commorcial Industrial Othor
Indicated Stream Width 4 a Sectionated Stream Depth: Riffle 0,2 = Rum _ m Pool 0,5 a Indig Water Mark _ m Velocity 230 Dam Present: Fee _ Re / Chamelined: Tee / Re	Local Metershed Brosion: Bone Moderate Beavy
Tanepy Covers (pen) Pertity Open Pertity Sheded Sheded Sheded Sheden Cornel Savege Petroleum Chomical Asserblic Mone Other Sheden Collision Absent Slight Mederate Profuse Sand Solict Shells Other Sheden Collision Asserblic Sheden Collision Sheden Components Sheden Collision Collisi	Local Watershed BPS Pollution: Be evidence Some Potential Sources (Sbrious Sources)
Partity Open Partity Open Partity Shaded Shaded Shaded Shaded Shaded Shaded Shaded Shades	Estimated Stroom Width 4 a Estimated Stroom Dopth: Biffle 0,2 p Rum _ = Fool 0,5 =
Section Sect	wigh water Mark p Velocity 230 Dem Present: Too Bo V Channelined: Tes V No
Jodgment Odors: (Rermal) Joseph Petroleum Chemical Asserblic Home Other	Canopy Covocs (Spon) Pertly Open Portly Sheded Sheded
Judge Savdust Paper Piber Sand Beliet Shells Other	DEDITHENT/SUBSTBATE:
Indicate Deposition Study Savdust Paper Piber Sand Bolict Sholls Other	Sodiment Odors: (Morme) Soveyo Potroloum Chemical Assorblic Mone Other
Tacegonic Substrate Components Tacegonic Substrate Components Percent Composition Industrate Type Dissector Industrate	Sodiment Gilo: (Absent) Slight Hodorato Profuse
Jacopselic Substrate Components Description Descripti	Sodiment Deposite: Sludge Sawdunt Papor Pibor Sand Balict Shalls Othor
Descent Composition of Composition o	hra the undersides of staues which are not deeply entydded black? Tos So
Composition Composition in Associate in Association Composition in Association Composition in Association Composition in Association Composition Compo	
Insperature 68 Disselved Caygon 7.7 pm 7.4 Conductivity 530 Other	publicate Type Dissector In Scioling Area Substrate Type Characteristic In Science Area Substrate Type Characte
Inter Oders: Bereal Sousge Potroleum Chemical Bane Other	rATES QUALITY Temperature 68 × Dissolved Oxygon 7.7 ps 7.4 Conductivity 530 Other
Nator Burface Ollo: Blick Shoon Globo Flocks Bone Purblidity: Clost Offshily Turbid Turbid Opeque Water Color	Itroop Typo: Colductor Warmustor
Webidity: Close affibily Turbid Turbid Opeque Water Color	Inter Oders: Mermal Sovage Patroloum Chemical Reme) Other
MATHER COMDITIONS	fator Burfaco Oilo: Slick Shoon Globo Flocho (Bono)
	furbidity: Close (Sfightly Turbid Turbid Opoquo Water Color
	VEATHER CONDITIONS
recent hankside tree removal	recent bankside tree removal
	PHOTOGRAPH SUMBER

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			Catagory	Fall	Poor
Hab	itat Parameter	Excellent	Good		
1.	*Bottom substrate/ available cover	Greater than 50% rubble, gravel, submerged logs, undercut banks, or other stable habitat. 16-20	30-50% rubble, gravel or other stable habitat. Adequate habitat.	10-30% rubble, gravel or other stable habitat. Habitat availablity less than desirable 6(-10)	Less than 10% rubble gravel or other stable habitat. Lack of habitat is obvious.
2.	Enbeddedness ^(b)	Gravel, cobble, and boulder particles are between 0 and 25 t surrounded by fine sediment 16-20	Gravel, cobble, and boulder particles are between 25 and 50 % surrounded by fine sediment	Gravel, cobble, and boulder particles are between 50 and 75 t surrounded by fine sediment 6(10)	Gravel, cobble, and boulder particles are over 75 % surrounded by fine sediment
3.	(0.15 cms (5cfs) + Flow at rep. low flow	Cold >0.05 cms (2 cfs) Warm >0.15 cms (5 cfs) 10-20	0.03-0.05 cms (1-2 cfs) 0.05-0.15 cms (2-5 cfs) 11-15	0.01-0.03 cms (.5-1 cfs) 0.03-0.05 cms (1-2 cfs) 6-10	(0.01 cms (.5 cfs) (0.03 cms (1 cfs) 0-5
	or >0.15 cms (5cfs) * Velocity/depth	Slow (c0.3 m/s), deep (>0.5 m); slow, shallow (c0.5 m); fast (>0.1 m/s), deep; fast, shallow habitats all	(missing riffles or runs	only 2 of the 4 habitat categories present (missing riffles/runs receive lower score).	Dominated by one valocity/depth category (usually pool).
		present. 16-20	(11)15	6-10	0-5
1.	• Channel alteration (a)	Little or no enlarge- ment of islands or point bars, and/or no channelization.	Some new increase in bar formation, mostly from coarse gravel; and/or some channelization present.	Moderate deposition of new gravel, coarse sand on old and new bars; pools partially filled w/silt; and/or embank- ments on both bank#mants	development; most pools filled w/silt; and/or extensive channelization
		12-15	8-11	(4)7	0-3
5.	Bottom scouping and deposition	Less then 5% of the bottom affected by scouring and deposition.	5-30% affected. Scour at constrictions and where grades steepen. Some deposition in pools.	10-50% affected. Deposits and scour at obstructions, constrictions and bends. Some filling of pools.	Hore than 50% of the bottom changing nearly year long. Pools almost absent due to deposition. Only large rocks in riffle exposed.
		12-15	6-11	(−i)	0-3

⁽a) From Ball 1982. (b) From Platts et al. 1983. Note: * = Habitat parameters not currently incorporated into BIOS.

			Categor	y.	
Hab	itat Parameter	Excellent	Good	Fair	Poor
6.	Pool/riffle, run/bend ratio (distance batween riffles divided by stream width)	5-7. Variety of habitat. Deep riffles and pools.	7-15. Adequate depth in pools and riffles. Bends provide habitat.	15-25. Occassional riffle or bend. Bottom contours provide some habitat.	>25. Essentially a straight stream. Generally all flat water or shallow riffle. Poor habitat.
		12-15	0-11	: 4(7)	0-3
7.	Bank stability ^(a)	Stable. No evidence of erosion or bank failure. Side slopes generally (10t. Little potential for future problem.	Hoderately stable. Infrequent, small areas of erosion mostly healed over. Side slopes up to 40% on one bank. Slight potential in extreme floods.	Hoderately unstable. Hoderate frequency and size of ecosional areas. Side slopes up to 60% on some banks. High erosion potential during extreme high flow.	Unstable. Hany ecoded areas. Side slopes >60% common. "Raw" areas frequent along straight section: and bends.
		9-10	6-8	(3)5	0-2
1.	Bank vegetative stability	Over 80% of the streambank surfaces covered by vegetation or boulders and cobbie. 9-10	50-79% of the streambank surfaces covered by vegetation, gravel or larger material. 6-8	25-49% of the stream- bank surfaces covered by vegetation, gravel, or larger material	Less than 25% of the streambank surfaces covered by vegetation, gravel, or larger material.
9 .	Streamside cover ^(b)	Dominant vegetation to shrub.	Dominant vegetation is of tree form.	Dominant vegetation is grass or forbes.	Over 50% of the stream bank has no vegetation and dominant material is soil, rock, bridge
		9 – 1 0	6-4	(-3)	materials, culverts, or mine tailings.
C٥	lumn Totals	score (02		7.0	

	RIEATSOW/WATER QUALITY DATA SHEET	Site 4 Blue Rive	r - Hwy 30
PRISICAL CHARACTERISATION BIPARIAN SOME/INSTREAM PRATURES	g		
Fredominant Surrounding Land Use:			
Poront Field/Pasture Agricultural Residential	Connercial Industri	lel Other	
Local Waterahed Brosies: Home Hederate Heavy			
Local Watershod HPS Pollution: No evidence Rome Potential	Jources Obvious Source	•	
Estimated Stream Width 5 n Batimated Stream Dopth: Biffle	0,2 • 100 =	Pool <u>0.5</u> =	
High Mater Hark n Velocity >30 Dem Present: Tee	So 🗹 Channelized:	: 100 <u>/</u> #0	
Camppy Cover: Open Fartly Open Fartly Shaded.	Sheded		
SEDIMENT/SUBSTRATE:			
Sediment Odore: Bereal Sevage Petroleum Chenica	l Asserable Mone	Other	
Sediment Oils: Absent Slight Moderate Profuse			
Sediment Deposits: Siudge Sawdust Paper Fiber S	and Rollet Shalls	Other	
Are the undersides of stemes which are not deeply entedded bloc	h? Tee #e		
Inorganic Substrate Compenents Porcent	Organie	: Substrate Component	Percent
Composition Substrate Type Dismotor in Sampling Area	Substrate Type	Characteriatic	Composition in Sampling Acon
Sedrock		ticks, Wood,	- 5%
Soulder >256-on (10 in.) Cobbio 64-356-on (2.5-10 in.) 10%	R	erse Plant Storials (CPOS)	414
100d 0.06-2.00-on (gritty) - 50%	, 0	lack, Very Fine (genic (FPOR)	
811t .00406-nn 2070 Clay (.004-nn jelich) 2070		réy, Shell regneats	
WATER QUALITY			
Temperature 60 xF Disselved Oxygen 9. ps 7.4	Conductivity	Other	
Instrument(s) Wood			
Streen Type: Caldwater Warnwater			
Water Oders: Wormal Sowage Potroloum Chemical	Hone Other		
Water Surface Offer Slick Sheen Globe Flocks	•••		
Turbidity: Closs Slightly Turbid Turbid Opeque	Water Color		-
	 		
partly cloudy	,		
PHOTOGRAPH RUMBER			

OBSERVATIONS AND/OR SEETCH

HABITAT ASSESSMENT FIELD DATA SHEET (cont.)	Blue Prince	Hay 35
HABITAT ASSESSMENT FIELD DATA SHEET (cont.)	DIVE KIVEZ -	TWY 30

			Catagor		
Hab	itat Parameter	Excellent	Good	Fair	Poor
6.	Pool/[iffle, run/bend ratio (distance between riffles divided by stream width)	5-7. Variety of habitat. Deep riffles and pools.	7-15. Adequate depth in pools and riffles. Bends provide habitat.	15-25. Occassional riffle or bend. Bottom contours provide some habitat.	>25. Essentially a straight stream. Generally all flat water or shallow riffle. Poor habitat.
		12-15	8-11	(<u>()</u>	0-3
7.	Bank stability ^(a)	Stable. No evidence of erosion or bank failure. Side slopes generally (10th. Little potential for future problem.	Moderately stable. Infrequent, small areas of erosion mostly healed over. Side slopes up to 40% on one bank. Slight potential in extreme floods.	Hoderately unstable. Hoderate frequency and size of erosional areas. Side slopes up to 601 on some banks. High erosion potential during extreme high flow.	Unstable. Hany eroded areas. Side stopes 160% common. "Raw" ereas frequent along straight sections and bends.
	•	9-10	6 8	. 1(5)	0 - 5
•	Bank vegetative stability	Over \$0% of the streambank surfaces covered by vegetation or boulders and cobbie.	50-79% of the streambank surfaces covered by vegatation, gravel or larger material. 6-8	25-49% of the stream- bank surfaces covered by vegetation, gravel, or larger material. 3-5	Less than 25% of the streambank surfaces covered by wegstation, gravel, or larger material.
9 .	Streamside cover ^[b]	Dominant vegetation is shrub.	Dominant vegetation is of tree form.	Dominant vegetation is grass or forbes.	Over 50% of the stream bank has no vegetation and dominant material
		9-10	6-4	1(-5)	is soil, rock, bridge materials, culverts, or mine tailings. 0-2
	lumn Totals				

	Category				
Hab	itat Parameter	Excellent	Good	Fair	Poor
1.	*Bottom substrate(Greater than 50% rubble, gravel, submerged logs, undercut banks, or other stable habitat. 16-20	30-50% rubble, gravel or other stable habitat. Adequate habitat.	10-30% rubble, gravel or other stable habitat. Habitat availability less than desirable. 6-10	Less than 10% rubble gravel or other stable habitat. Lack of habitat is obvious. 0-5
2.	Enbeddedness ^(b)	Gravel, cobble, and boulder particles are between 0 and 25 % surrounded by fine sediment 16-20	Gravel, cobble, and boulder particles are between 25 and 50 t surrounded by fine sediment	Gravel, cobble, and boulder particles are between 50 and 75 t surrounded by fine sediment	Gravel, cobble, and boulder particles are over 75 % surrounded by fine sediment
		19-50			
3.	£0.15 cms (5 cfs) → *Floy at rep. low flow (4)	Cold >0.05 cms (2 cfs) Warm >0.15 cms (5 cfs) 10-20	0.03-0.05 cms (1-2 cfs) 0.05-0.15 cms (2-5 cfs) 11-15	0.01-0.03 cms (.5-1 cfs) 0.03-0.05 cms (1-2 cfs) 6-10	(0.01 cms (.5 cfs) (0.03 cms (1 cfs) 0-5
	or >0.15 cms (5cfs) + Velocity/depth	Slow ((0.3 m/s), deep (>0.5 m); slow, shallow (<0.5 m); fast (>0.3 m/s), deep; fast, shallow habitats all	(missing riffles or runs	Only 2 of the 4 habitat categories present (missing riffles/runs receive lower score).	Dominated by one valocity/depth category (usually pool).
		present. 16-20	(11)15	6-10	0-5
1.	• Channel alteration [a]	Little or no enlarge- ment of islands or point bars, and/or no channelization.	Some new increase in bar formation, mostly from coarse gravel; and/or some channelization present.	Moderate deposition of new gravel, coarse sand on old and new bars; pools partially filled w/silt; and/or embank- ments on both banks	Heavy deposits of fine material, increased bar development; most pools filled w/silt; and/or extensive channelizatio
		12-15	8-11	(-7)	0-1
5.	Bottom scouffing and deposition	Less then 5% of the bottom effected by scouring and deposition.	5-30% affected. Scour at constrictions and where grades steepen. Some deposition in pools.	10-50% affected. Deposits and scour at obstructions, constrictions and bends. Some filling of pools.	More than 50% of the bottom changing nearly year long. Pools almost absent due to deposition. Only large rocks in riffle exposed.
		12-15	8-11	. (5)	0-3

⁽a) From Ball 1982.
(b) From Platts et al. 1983.
Note: * = Habitat parameters not currently incorporated into BIOS.

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Type of Sampler				ATE DATA SHEET Sample No. #2 Date October 12, 1994			
Collection Depth				Date <u>October 12, 1994</u>	1		
Substrate Type <u>Snaa</u>			·	Location			
Remarks				Blue River at Mody	<i>3</i> 3 ·	:	
Sorted by B	NBOOM	both		Columbia City,	<i>JN</i> .		
M.	. Broad	<u>ldus</u>		Station # <u>Site 4</u>			
Identification by G.B.	right			Collector anonyth 5.	Chafir	<u> </u>	
Enter Family and/or Genu	s and	Spec	ies Na	Location Blue River at Mady Columbia City, Station # Site 4 Collector Grangus 5. ame on Blank Line.			
Organisms	No.	A.	I.		No.	Α.	Ι.
Diptera		<u> </u>		Coleoptera			<u> </u>
Chironomidae		↓	1	Macronychus glabratus		ļ	
Orthocladius obumbiatus	3	<u> </u>	\square	, , ,		L	<u> </u>
Thienemainymia Sp.		<u> </u>				ļ	ļ
		↓	\vdash				<u> </u>
		 	$\perp \perp$	Neuroptera and Megaloptera	<u></u>		
		-					
		├		Churchaga	ļ		
		ļ		Crustacea			
		 			ļ		
			\vdash			<u> </u>	-
		 				<u> </u>	-
			\vdash	Oligochaeta			
Other Simulidae	7	-	\vdash	O 1 1 go Cita e ta		-	
other Simuliane			\vdash				
Trichoptera		-		· · · · · · · · · · · · · · · · · · ·			
Hudrong school hatteri	64						
Hydropsyche hetteni H. Chanis	<u> </u>			Hirudinea			
Chaumatnasida can	3			iiii da iiica			
Cheumatopsyche spp. Ceratopsyche bifida	3						
CETATOPOYERE BISTAM				Bivalvia			
				5110111			
Plecoptera							
- Todopoci u							
		\Box		Gastropoda			
				Ferrissia rivularis	1		
Ephemeroptera				Physella spp.	1		
Stenacron interpundatum	1						
Baetis hrunnercolor	17						
Baetis brunneicolor B. Flavistriga	2			Bryozoa			
3-							
				Coelenterata			
<u>Odonata</u>				Other			
Harris A.							
<u>Hemiptera</u>							
			\dashv				
		+	-+			-	\dashv
A = Adult. I = Immature	l						
Total No. Organisms	100			Total No. Taxa 11 G	enera		
Total No. Organisms	$-\nu\nu$			10041 1101 14/4			

oe of Sampler	MACRO	INVE	RTEBRA	Station # Site 4 Collector GNS AMERICAN COLLEGE COLLEG			
lection Depth				Date Oct. 12, 1994	. ii .	22	
ostrate Type <u>Shag</u>				Location Blue River a	+ HWY	33	
narks	na Ha	<u>.</u>		COTOMBIA CITY , M	<u>·</u>		
Sorted by Tuy bu	Bright	r		Station # Site 4			
entification by G. 7	Bright			Collector Buchasia (I. Brig	4+	
ter Family and/or Genu	is and	Spec	ies Nar	ne on Blank Line.	J		
ganisms	No.	ΙΑ.	I.		No.	Α.	I.
ntera l		L		Coleoptera			<u> </u>
Chironomidae				Macronychus glabratus	_2		
Orthocladius obumbratus	- 5	 					
Cricotopys bicinctus	7	 	\vdash				
Orthocladius obumbatus Cricotopus bicinctus Paralauterborniella sp. Thieriemaanymia sp.		 	1	Neuroptera and Megaloptera			
Injenemanymia sp.							
		 		Crustacea			
				0.430400			
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				Oligochaeta			
ner Simuliidae	5					-	\vdash
choptera							\Box
Hydropsyche betteri	35						
H. Cuanis	35 5			Hirudinea			
Cheunatopsyche spp.	5 8					<u> </u>	<u> </u>
H. Cuanis Cheumatopsyche spp. Ceratopsyche bifida				D: . 2			
				Bivalvia			\vdash
ecoptera							
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					 	ļ	\vdash
·				Gastropoda Ferrissia rivularus:			$\vdash \vdash \vdash$
				_ Ferrissia rivularus			-
Realis havesiales	16		-				
Baetis brunneicolor	10						
B. Flavistriga Stenacron interpunctatum	2			Bryozoa			\sqcup
Stenonema Vicarium							\vdash
				Coelenterata			\vdash
onata				Other		\vdash	$\vdash \vdash \vdash$
Aeschna sp.	1						$\vdash \vdash \vdash$
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niptera							
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= Adult, I = Immature				1/1		•	
tal No Organisms	-1DD			Total No. Taxa 14 Ger	iera		

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		Catagory	·	
Habitat Parameter	Excellent	Good	Fair	Poor
 Pool/riffle, run/bend ratio (distance between riffles divided by stream width) 	5-7. Variety of habitat. Deep riffles and pools.	7-15. Adequate depth in pools and riffles. Bends provide habitat.	15-25. Occassional riffle or bend. Bottom contours provide some habitat.	>25. Essentially a straight stream. Generally all flat water or shallow riffle. Poor habitst.
	12-15	(a-)1 1	. 4-7	0-3
7. Bank stability ^(a)	Stable. No evidence of erosion or bank failure. Side slopes generally (30%. Little potential for future problem.	Hoderately stable. Infrequent, small areas of erosion mostly healed over. Side slopes up to 401 on one bank. Slight potential in extreme floods.	Hoderately unstable. Hoderate frequency and size of erosional areas. Side slopes up to 60% on some banks. High erosion potential during extreme high flow.	Unstable. Hany eroded eress. Side slopes >60% common. "Raw" eress frequent along streight sections and bends.
	9 – 1 0	6 – 8	¥(-5)	0 – 3
8. Bank vegetalive stability	Over 80% of the streambank surfaces covered by vegetation or boulders and cobble. 9-10	50-79% of the streambank surfaces covered by vegetation, gravel or larger material.	25-49% of the stream- bank surfaces covered by vegetation, gravel, or larger material. 3-5	Less than 25% of the streambank surfaces covered by vegetation, gravel, or larger material.
9. Streamside cover ^(b)	Dominant vegetation is shrub.	Dominant vegetation is of tree form.	Dominant vegetation is grass or forbes.	Over 50% of the stream bank has no vegetation and dominant material is soil, rock, bridge materials, culverts,
	9-10	6-4	(3)	or mine tailings.
Column Totals	90 —	_		
	scor 80		21.	

26

			Category		
abı	tat Parameter	Excellent	Good	Fair	Poor
		Greater than 50% rubble, gravel, submerged logs, undercut banks, or other stable habitat. 16-20	30-50% rubble, gravel or other stable habitat. Adequate habitat.	10-30% rubble, gravel or other stable habitat. Habitat availability less than desirable	Less than 10% rubble gravel or other stable habitat. Lack of habitat is obvious. 0-5
	Embeddedness (b)	Gravel, cobble, and boulder particles are between 0 and 25 t surrounded by fine sediment 16-20	Gravel, cobble, and boulder perticles are between 25 and 50 % surrounded by fine sediment	Gravel, cobble, and boulder particles are between 50 and 75 t surrounded by fine sediment 6-10	Gravel, cobble, and boulder particles are over 75 % surrounded by fine sediment
	(0.15 cms (5cfs) * *Floy(4) at rep. lou flow	Cold >0.05 cms (2 cfs) Warm >0.15 cms (5 cfs) 10-20	0.01-0.05 cms (1-2 cfs) 0.05-0.15 cms (2-5 cfs) 11-15	0.01-0.03 cms (.5-1 cfs) 0.03-0.05 cms (1-2 cfs) 6-10	(0.01 cms (.5 cfs) (0.03 cms (1 cfs)
	or >0.15 cms (5cfs) * Velocity/depth	Slow ((0.3 m/s), deep (>0.5 m); slow, shallow ((0.5 m); fast (>0.1 m/s), deep; fast, shallow habitats all	(missing riffles or runs	Only 2 of the 4 habitat categories present (missing riffles/runs receive lower score).	Dominated by one velocity/depth category (usually pool).
		present. 16-20	.11(15)	6-10	0-5
4.	· Channel alteration (a)	Little or no enlarge- ment of islands or point bars, and/or no channelization.	Some new increase in bar formation, mostly from coarse gravel; and/or some channelization present.	moderate deposition of new gravel, coarse sand on old and new bars; pools partially filled wysilt; and/or embank- ments on both banks	Heavy deposits of fine material, increased ba development; most pool filled w/silt; and/or extensive channelizati
		12-15	8-11		
5.	Bottom scouring and deposition	Less then 5% of the bottom affected by scouring and deposition.	5-30t affected. Scour at constrictions and where grades steepen. Some deposition in pools.	10-50% affected. Deposits and scour at obstructions, constructions and bends. Some filling of pools.	More than 50% of the bottom changing nearly year long. Pools almost absent due to deposition. Only large rocks in riffle exposed.
		12-15	8-11	(-7)	0-3
_				.54	

PHISICAL	CHARACTERISATION/WATER	QUALITY
	PIELD DATA SHEET	

Eel R. - D/S (5He 6)

process procedures bericultures				
Part Conserved Part Pa				
codeminant Successeding Land Uses orest Field/Pasture Apricultural Bouldantial Commercial Industrial Other oreal Watershed Broslam: Bone Gederate Many oreal Watershed Broslam: Bone Gederate Many oreal Watershed Broslam: Bone Gederate Strone Septh: SIFTS INL P Non Procedure originated Strone Width Mon Retinated Strone Depth: SIFTS INL P Non Procedure originated Strone Width Mon Retinated Strone Depth: SIFTS INL P Non Procedure originated Strone Width Mon Pastly Open Pastly Sheded Strone Tourism Pastly Open Pastly Sheded Strone Tourism Pastly Open Pastly Sheded Strone Tourism Strone Pastly Open Pastly Sheded Strone Tourism Strone Pastly Open Pastly Sheded Strone Tourism Strone Open Tourism Strone Open Tourism Strone originate Spring Strone Open Tourism Strone Open Tourism Strone Interpolate Substrate Components Detriture Strone Substrate Components Strone Type Disneter Interpolation Strone Type Disneter Interpolation Strone Type Open Interpolation Open Interpolate Open Interpolation Strone Type Coldwater ANTERS COMDITIONS SUMMY 6 2 94				
Sunny 6 2 94				
Superistro Sup				
Sumpy Sump		dential Commercial	Industrial Other	
Summy 6 2 94 States and Streen Width O m Estimated Streen Depth: Siffic D. D. Sum may real manage of the street o				
Property States Name Partity Door Partity Shaded Sh	_	J	vious Sources	
Consept Cover: (open Partly Open Partly Sheded: Sheded SEDIMENT/SUBSTRATE: Redianat Oder: (ornal) Savage Patroloum Chemical Asserable None Other Redianat Oder: (ornal) Savage Patroloum Chemical Asserable None Other Redianat Oder: (ornal) Savage Patroloum Chemical Asserable None Other Redianat Oder: (other Slight Roderete Profuse Redianat Oder: Sludge Savdust Paper Fiber Sand Reliet Shells Other Are the undersides of stoes which are not deeply ent-dded blacks Too Insergacic Substrate Components Fercent Composition Inserted Type Dissector (components Percent Composition Inserted Type Dissector (ones of the Savage) Redianat Oderete Slicks, Wood, Course Plant Composition Inserted Siles, Wood, Course Composition Inserted Siles, Wood, Course Composition Inserted Type Characteristic Inserted Type Control Type Conductivity Other RATHER COMDITIONS SUMMY 6 2 94		a: Biffie DiZ . Bun	P Pool n	
Summer S	High Water Mark m Velecity >30 Dem Proc	ent: Tes #• /	Chennelized: Tes 🔨 🖽	
Jack States (Seres) Sevage Potreleum Chemical Anserable Home Other Sediment Oiles (Absent) Blight Redorate Profuse Sediment Oiles (Absent) Blight Redorate Oiles (Absent) Blight Redorate Components (Composition In Sampling Area Sediment Oiles) Blight Redorate (Composition In Sampling Area Sediment Oiles) Blight Redorate (Composition In Sampling Area Obtains (Absent) (Absent	Canopy Cover: Open Partly Spen Partly Sh	eded. Shaded		
Sight Roderate Profuse States Deposition Sludge Saudust Paper Piber Sand Belief Shells Other Inorganic Substrate Components Percent Composition in Sampling here Substrate Type Dissolve (16 in.) Substrate Type Dissolve (16 in.) Substrate Type Dissolve (16 in.) Substrate Type Coarse (16 in.) Substrate Type Sticks, Wood, Coarse Plant Coarse Plant Substrate Type Sticks, Wood, Substrate Coapening here Substrate Type Sticks, Wood, Substrate Type Characteristic (16 Substrate Type Coarse Plant Coarse Plant Coarse Plant Substrate Type Sticks, Wood, Substrate Type Sticks, Wood, Substrate Type Coarse Plant Coarse Plant Coarse Plant Substrate Type Office (16 in.) Substrate Type Coadectivity Substrate Type Coadectivity Other Substrate Office Stick Substrate Office Substrate Type Coadectivity Other Substrate Composition Character Substrate Substrat	IEDIHEHT/SUBSTRATE!			
Are the undersides of stones which are not deeply entroded black? Too Inargenic Substrate Compensate Percent Composition Inargenic Substrate Compensate Percent Composition In Substrate Type Dismotor Composition In Substrate Type Dismotor Composition In Substrate Type Detritus Control Plant Contr	lediment Oders: Marmal Sevage Petroloum	Chemical Asserable	c Sone Other	
Inerganic Substrate Components Total Components Total Components Total Components	Sédiment Gile: Absent Slight Roderate	Profuso		
Intergrant Substrate Components Percent Composition Substrate Type Diseaser In Substrate Type Characteristic In Substrate Type Detritue Components Percent Composition In Substrate Type Diseaser In Substrate Type Characteristic In Substrate Type Detritue Control Plant Country Interval Justine (1-1-1-3 In.) — 20 Ruch-Mud Diseaser In Substrate Components Percent Country Interval Diseaser In Substrate Type Control Plant Interval In	Sodiment Deposits: Sludge Savdust Fapor Fi	bor Sand Bolict	Shells Other	
Percent Composition Composition Composition In January Disaster View Disaster View Disaster View Disaster View Disaster View Disaster View Detritus Composition In January View Detritus Detritus Detritus Composition In January View Detritus Detritus Detritus Composition In January Detritus Detritus Detritus Composition In January Detritus Detritus Composition In January Detritus Control View Detritus Detr	Are the undersides of stones which are not deeply ent	sddod block? Too (F	•	
Sunny 6 2 94		!	Organic Substrate Compane	
Referebles 1256-mm (10 im.) 256-mm (10 im.) 2570 2570 2510 2570 2	Composi	tien j	•	Composition
ATER QUALITY capperature _ C Dissolved Oxygon _ pH _ Conductivity _ Other	· · · · · · · · · · · · · · · · · · ·		<u>Characteristic</u>	
1-44-ms (4)-1-2-5 (a) -350 Ruch-Rud 1-45-ms (4)-1-5-ms (2)-45-ms (2)	loulder >256-am (10 tm.)	Detritue	Concso Plant	5%
ATER QUALITY Capporature C Dissolved Oxygon pf Conductivity Other Cater Odors: Seres Strain Saves Strain Cater Strain Conductor Cater Strain Cater Str	1 4 4 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	 Nuch-Hud		•
ATTER QUALITY caperature	1006 0.06-3.06-an (gritty) 50	Mari	Organic (FFOM)	
construent(s) Used ctrons Type: Coldwater Carmenta Severy Stateleus Chemical Hone Other cater Odors: Hornal Severy Stateleus Chemical Hone Other cater Surface Offer Slick Shoon Globe Flocks Hone urbidity: Closs Slightly Turbid Turbid Opaque Water Color HATHER COMDITIONS SUNNY 6 2 94	tlay (.004-mm (alich)	, i	Fragmonts	
construent(s) Used ctrons Type: Coldwater Caravata state Odors: Serael Seven Store Chesical Seco Other ctor Serface Offer Slick Shoon Globe Flocks Sene wrbidity: Closs Sightly Turbid Turbid Opaque Water Color SATHER COMDITIONS SUNNY 6 2 94				
sateument(s) Used	ATER QUALITY			
trone Type: Coldvator Carmustand Source State Color Source State Color Source S	emperature C Disselved Oxygem	p# Conductivit	y Other	
ator Odors: Horas Soung Statulaus Chosical Boso Othor	nateumont(s) Good			
actor Surface offer Slich Shoon Clobe Plocks Book urbidity: Close (1)ghtly Turbid Turbid Opaque Water Color MATHER COMBITIONS SUNNY 6/2/94	trees Type: Coldwater Warsvates			
SUNNY 6/2/94	eter Oders: Hernel Seven Silvereleum Ci	enical Sens Oth	••	_
Sunny 6/2/94	ator Surface Ofle: Slich Shoon Globe	Flocks Sone		
Sunny 6/2/94	urbidity: Close (Alightly Turbid) Turbid	Opaque Water Color		
Sunny 6/2/94				
	FEATHER COMDITIONS			
	Sunny 6/2	94		
	, ,			
	·			
	BSERVATIONS AND/OR SERTCE			

Excellent	Good	Fair	Poor
5-7. Variety of habitat. Deep riffles and pools.	7-15. Adequate depth in pools and riffles. Bends provide habitat.	15-25. Occassional riffle or bend. Bottom contours provide some habitat.	>25. Essentially a straight stream. Generally all flat water or shallow riffle. Poor habitat.
12-15	8-11	(')	0 - 3
Stable. No evidence of erosion or bank failure. Side slopes generally (30t. Little potential for future problem.	Moderately stable. Infrequent, small areas of erosion mostly healed over. Side slopes up to 40t on one bank. Slight potential in extreme floods.	Moderately unstable. Hoderate frequency and size of erosional areas. Side slopes up to 601 on some banks. High erosion potential during extreme high flow.	Unstable. Hany eroded areas. Side slopes 760% common. "Raw" areas frequent along straight sections and bends.
9-10	6 – 8	(-,)	0 - 2
Over 80% of the streambank surfaces covered by vegetation or boulders and cobble.	50-79% of the streambank surfaces covered by vegetation, gravel or larger material.	25-49% of the stream- bank surfaces covered by vegetation, gravel, or larger material.	Less than 25% of the streambank surfaces covered by vegetation. gravel, or larger material.
Dominant vegetation ts shrub.	Dominant vegetation is of tree form.	Dominant vegetation is grass or forbes.	Over 50% of the stream bank has no vegetation and dominant material is soil, rock, bridga materials, culverts, or mine tailings.
9-10	6 – 8	3 (5)	0-2
/ 0 —			-
_	stable. No evidence of erosion or bank failure. Side slopes generally (10t. Little potential for future probles. 9-10 Over 10t of the streambank surfaces covered by vegetation or boulders and cobble. 9-10 Dominant vegetation is shrub.	Stable. No evidence of erosion or bank failure. Stables and colors generally (10%) Little potential for future problem. 9-10 Over 10% of the streambank surfaces covered by vegetation or boulders and cobble: 9-10 Dominant vegetation is of tree form. 9-10 Dominant vegetation or bounders and cobble: 9-10 Dominant vegetation is of tree form.	Stable. No evidence of erosion or bank failure. Side slopes generally (101). Little potential in extreme problem. 9-10 Over 101 of the streambank surfaces covered by vegetation or boulders and cobble. 9-10 Dominant vegetation is of tree form. 9-10 Dominant vegetation is of tree form. 9-10 Cotor 101 of the streambank surfaces covered by the streambank surfa

		АТІВАН	T ASSESSMENT FIELD DATA SHE	ET Eel River	- U/S
			Category		
Hab	itat Parameter	Excellent	Good	fair	Poor
1.	*Bottom substrate/ available cover	Greater than 50% rubble, gravel, submerged logs, undercut banks, or other stable habitat. 16-20	30-50% rubble, gravel or other stable habitat. Adequate habitat.	10-30% rubble, gravel or other stable habitat. Habitat availability less than desirable	Less than 10t rubble gravel or other stable habitat. Lack of habitat is obvious. 0-5
2.	Embeddedness ^(b)	Gravel, cobble, and boulder particles are between 0 and 25 % surrounded by fine sediment	Gravel, cobble, and boulder particles are between 25 and 50 t surrounded by fine sediment	Gravel, cobble, and boulder particles are between 50 and 75 t surrounded by fine sediment	Gravel, cobble, and boulder particles are over 75 % surrounded by fine sediment
3.	(0.15 cms (5cfs) + *Floyiat rep. low flow	Cold >0.05 cms (2 cfs) Warm >0.15 cms (5 cfs) 10-20	0.03-0.05 cms (1-2 cfs) 0.05-0.15 cms (2-5 cfs) 11-15	0.01-0.03 cms (.5-1 cfs) 0.03-0.05 cms (1-2 cfs) 6-10	
	or >0.15 cms (5cfs) * Velocity/depth	Slow (<0.3 m/s), deep (>0.5 m); slow, shallow (<0.5 m); fast (>0.3 m/s), deep; fast, shallow habitats all	(missing riffles or runs	Only 2 of the 4 habitat categories present (missing riffles/runs receive lower score).	Dominated by one velocity/depth category (uscally pool).
		present. 16-20	11-15	6(-10)	0-5
4.	• Channel alteration (a)	Little or no enlarge- ment of islands or point bars, and/or no channelization.	Some new increase in bar formation, mostly from coarse gravel; and/or some channelisation present.	Moderate deposition of new gravel, coarse sand on old and new bars; pools partially filled w/silt; and/or embank- ments on both banks.	Heavy deposits of fine material, increased bar development; most pools filled m/silt; and/or extensive channelizatio
		12-15	8-11	(-i	0-1
5.	Bottom scouring and deposition	Less than 5% of the bottom affected by scouring and deposition.	5-30% affected. Scour at constrictions and where grades steepen. Some deposition in pools.	10-50% affected. Deposits and scour at obstructions, constrictions and bends. Some filling of pools.	More than 50% of the bottom changing nearly year long. Pools almost absent due to deposition. only large rocks
		12-15	8-11	(-1)	in riffle exposed.

⁽a) From Ball 1982. (b) From Platts et al. 1983. Note: "= Habitat parameters not currently incorporated into BIOS.

PRISICAL CHARACTERISATION			
BIPARTAM SOME/INSTREAM PEATURES			
Prodominant Surrounding Land Use:			
Posest Field/Pasture (Agriculture) Residential	Connercial I	ndustrial Other	
Local Watershed Bresien: Hone (Mederate) Heavy			
Local Watershed MPS Pollution: No evidence (Some Potentia	1 Jources Obvious	Sources	
Estimated Stream Width 10 m Setimated Stream Depth: Biffl	• 0.3 • Run	_ =	
High Water Mark p Velocity >30 Dem Procent: Too		alised: Tee	
Canopy Cover: Open Partly Open Partly Sheded	Shaded		
BEDIMENT/SUBSTRATE:			
Sediment Odors: (Mermal) Sevage Petroloum Chemic	al Ameerabic	Hone Other	
Sediment Gilo: Absent Slight Hoderate Profuse			
	Sand Beliet Shel	is Other	
Are the undersides of stones which are not deeply entedded blo	ch? Yes He		
Inorganic Substrate Components		Organic Substrate Compone	nt.
Percent Composition	1		Percent Composition
Substrate Type Diameter in Sampling Acea	<u>Substrate Type</u>	Characteristic	in Sompling Ace
Bedrock Boulder >256-am (10 in.)	Detritus	Sticks, Wood, Conces Plant	1%
Gravel 2-64-ma (0.1-2.5 in.) - 9	Ruck-Hud	Materials (CPOM) Black, Very Pine	
844 9.06-2.08-am (gritty) - (60 811t .08406-am - 30	Mart	Organic (FPOM) Grey, Shell	
Clay (.004-nn (elich)	i	Frequents	
MATER QUALIFY Temporature C Dissolved Oxygem p#	Coaductivity	Other	
Stroom Type: Celduster Wirmuster			
Mater Odore: Germa) Sowage Potroloum Chemical	Bone Other_		
Nator Surface Offs: Slick Shoom Globs Flocks	€		
Furbidity: Clear Slightly Turbid Turbid Opaque	Water Color		
SATURE COMPITIONS			
PHOTOGRAPH MUMBER			
EBOSAANULA ULIBAA			
AND THE COURT OF T			
BSERVATIONS AND/OR SERTCH			

			Category		
Hab	tat Parameter	Excellent	Good	Fair	Poor
1.	*Bottom substrate/ available cover	Greater than 50% rubble, gravel, submerged logs, undercut banks, or other stable habitat. 16-20	10-50% rubble, gravel or other stable habitat. Adequate habitat.	10-30% rubble, gravel or other stable habitat. Habitat availability less than desirable. 6-10	Less than 10% rubble gravel or other stable habitat. Lack of habitat is obvious.
2.	Embeddedness (b)	Gravel, cobble, and boulder particles are between 0 and 25 % surrounded by fine sediment	Gravel, cobble, and boulder particles are between 25 and 50 % surrounded by fine sediment	Gravel, cobble, and boulder particles are between 50 and 75 t surrounded by fine sediment 6-10	Gravel, cobble, and boulder particles are over 75 % surrounded by fine sediment
3.	f0.15 cms (5cfs) * *Flow at rep. low flow	Cold >0.05 cms (2 cfs) Warm >0.15 cms (5 cfs) 10-20	0.03-0.05 cms (1-2 cfs) 0.05-0.15 cms (2-5 cfs) 11-15	0.01-0.03 cms (.5-1 cfs) 0.03-0.05 cms (1-2 cfs) 6-10	(0.01 cms (.5 cfs) (0.03 cms (1 cfs)
	or >0.15 cms (5cfs) → Velocity/depth	Slow ((0.3 m/s), deep (>0.5 m); slow, shallow ((0.5 m); fast (>0.1 m/s), deep; fast, shallow habitats all present. 16-20	only 3 of the 4 habitat categories present (missing riffles or runs raceive lower score than missing pools).	Only 2 of the 4 habitat categories present (missing riffles/runs receive lower score).	Dominated by one velocity/depth category (usually pool).
1.	* Channel alteration (a)	Little or no enlarge- ment of islands or point bars, and/or no channelization.	Some new increase in bar formation, mostly from coarse gravel; and/or some channelization present.	Moderate deposition of new gravel, coarse sand on old and new bars; pools partially filled w/silt; and/or embank- ments on both banks.	Heavy deposits of fine material, increased bar development; most pools filled w/silt; and/or extensive channelization
					More than 50% of the
5.	Bottom scouring and deposition	Less than 5% of the bottom affected by scouring and deposition.	5-30t affected. Scour at constrictions and where grades steepen. Some deposition in pools.	10-50% affected. Deposits and scour at obstructions, con- strictions and bends. Some filling of pools.	bottom changing nearly year long. Pools almost absent due to deposition. Only large rocks
		12-15	(8-)11	4-7	in riffle exposed.

⁽a) From Ball 1982. (b) From Platts et al. 1981. Note: *= Habitst parameters not currently incorporated into BIOS.

HABITAT ASSESSMENT FIELD DATA SHEET (cont.

			Catagory		
Hab	itat Parameter	Excellent	Good	Fair	Poor
6.	Pool/ciffle, run/bend ratio (distance between riffles divided by stream width)	5-7. Variety of habitat. Deep riffles and pools.	7-15. Adequate depth in pools and riffles. Bends provide habitat.	15-25. Occassional riffle or bend. Bottom contours provide some habitat.	>25. Essentially a straight stream. Generally all flat water or shallow riffle. Poor habitat.
		12-15	8(11)	1-7	0-3
7.	Bank stability ^(a)	Stable. No evidence of erosion or bank failure. Side slopes generally (30%. Little potential for future problem.	Moderately stable. Infrequent, small areas of erosion mostly healed over. Side slopes up to 40 on one bank. Slight potential in extreme floods.	Moderately unstable. Moderate frequency and size of erosional areas. Side slopes up to 60t on some banks. High erosion potential during extreme high flow.	Unstable. Hany ecoded areas. Side slopes 560% common. "Raw" areas frequent along straight section and bends.
		9-10	6(8)	3-5	0 - 2
	Bank vegetative stability	Over \$0% of the streambank surfaces covered by vegetation or boulders and cobble. 9-10	50-79% of the streambank surfaces covered by vegetation, gravel or larger material.	25-49% of the stream- bank surfaces covered by vegetation, gravel, or larger material.	Less than 25% of the streambank surfaces covered by vegetation, gravel, or larger material.
9.	Streamside cover [b]	Dominant vegetation is shrub.	Dominant vegetation is of tree form.	Dominant vegetation is grass or forbes.	Over 50% of the stream bank has no vegetation and dominant material is soil, rock, bridge materials, culverts,
		9-10	(-1)	1-5	or mine tailings.
co	lumn Totals	score 91 —		35	

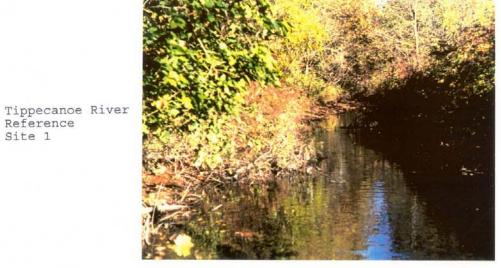
Metric Values

	Sample 1	Sample 2
Total Genera	14	11
EPT Genera	6	5
Scrapers/Filterers	0.07	0.04
% Dominant Taxon	35	64
EPT/Chironomids	9.1	22
Community Loss Index	1.2	1.5
Hilsenhoff Biotic Index	6.1	7.0
% Shredders in CPOM	0	0

Site Scores in Relation to the Reference

	Sample 1	Sample 2
Total Genera	4	2
EPT Genera	6	6
Scrapers/Filterers	0	0
% Dominant Taxon	2	0
EPT/Chironomids	6	6
Community Loss Index	4	4
Hilsenhoff Biotic Index	4	4
% Shredders in CPOM	0	0
	26	22

Mean Site Score = 24
Each duplicate is within 10% of the mean



Blue River Highway 33 Site 2



Blue River Riley Road Site 3





Blue River Highway 30 Site 4



Eel River CR 200 S Site 5



Eel River Washington Road Site 6